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## Polymerizable Adhesive of Dimethacrylglycerophosphoric Acid

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1 Claim - No drawing

Adhesives so far have been selected in a more or less empirical manner, I have endeavoured on the basis of general considerations to find a class of adhesives suitable for a special case.

In dental practice it is desirable to bond self-setting cast fillings made of artificial resins to the dentine of a tooth cavity.

The tooth substantially consists of an inorganic crystal-lattice (apart from the filling is an organic material such as "artificial glass" (acrylic resin thermoplastic material). The bonding intermediate layer, which acts as adhesive, should therefore present a polar group towards the ion-lattice and be anchored by means of a non-polar group in the artificial resin. The adhesive should also be resistant to swelling, since in a person's mouth it is exposed to the continuous action of water. Adhesives to be used for bonding inorganic surfaces inter se or to organic surfaces, therefore have to meet the following requirements.

The molecule should possess an acid, basic or complex-forming group, i.e. a polar group, on one hand and on the other hand at least two polymerisable groups. Moreover it should be readily spreadable and not polymerise in storage.

The subject matter of my present invention is an improvement in the art of bonding surface to surface by a thin layer, defined by placing an adhesive—which comprises at least one monomer containing in its molecule a polar group and at least two polymerisable groups, which monomer forms polydimensional structures on polymerisation—between the surfaces to be bonded and polymerising the adhesive in the presence of a polymerisation catalyst.

In practice, monomers containing acid substituents have proved particularly suitable.

### Example

1 mol of the sodium glycerophosphate is esterified in aqueous solution at a temperature of 0°C with 2 mols of methacryloylchloride, the solution being held alkaline by successively adding 2 mols alkali-

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hydroxide. After completion of the esterification, the solution is acidified with 1 mol diluted  $H_2SO_4$  and the supernatant layer of the ester isolated in a separating funnel.

The dimethacryl-glycerophosphoric acid ester so obtained may be catalytically polymerised by the action of sulfinic acid in a period of 5 to 30 minutes and at a temperature of 20°C.

Surfaces bonded by this product gave the following figures when subjected to the shear-test, after having been submerged in water for one day and one month respectively:

Material of surface	Shearing-strength kg/cm <sup>2</sup>	
	1 day	1 month
Porcelain — Plexiglass	240	180
Ivory — "	200	90
Gold — "	140	60
V <sub>2</sub> A-Steel — "	650	200
Aluminium — "	170	150
Aluminium — (medically oxidized)	200	180
Glass — Plexiglass	190	140

In dental practice, the cavity of the tooth is damped with the adhesive, and a paste of monomer and polymer containing a polymerization catalyst effective at room temperature, is plugged into the cavity. The catalyst causes a simultaneous setting of the adhesive and filling material at the temperature of the mouth. The intermediate layer of the adhesive also affords an improved marginal bond. For industrial purposes, the polymerization catalyst is dissolved in the adhesive, and the solution spread on the surfaces to be bonded.

The adhesives specified above are of the general formula  $\begin{matrix} A & B \\ & C \end{matrix}$  where A and B are polymerizable groups and C is a polar group.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

A polymerizable adhesive consisting essentially of dimethacrylglycerophosphoric acid.

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